

What is claimed is:

1. A plasma processing apparatus for implementing plasma processing on a workpiece, comprising:

a plasma processing chamber, the atmosphere in which is sustained at a reduced pressure during said plasma processing;

an electrode provided inside said plasma processing chamber that is constituted to allow said workpiece to be placed thereupon and is capable of traveling between an upper plasma processing position and a lower delivery position;

an electrostatic chuck provided at a mounting surface of said electrode that detachably electrostatic holds said workpiece when a high level DC voltage is applied thereto;

a delivery chamber engaged in transfer of said workpiece with said plasma processing chamber with the atmosphere therein sustained at a higher pressure compared to the atmosphere in said plasma processing chamber;

a means for opening/closing that switchably connects said plasma processing chamber and said delivery chamber while retaining airtightness therein; and

a means for control that engages in control to induce a gas inside said delivery chamber into said plasma processing chamber by opening said means for opening/closing until said electrode departing said plasma processing position reaches said delivery position after said plasma processing is completed.

2. A plasma processing apparatus according to claim 1, wherein;

said means for control implements control for applying to said electrostatic chuck a high level DC voltage with a reverse polarity from the polarity of said high level DC voltage applied to said electrostatic chuck while said electrostatic chuck is vacuum holding said

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workpiece, until immediately after said means for opening/closing is opened.

3. A plasma processing apparatus according to claim 1, wherein;
before said means for opening/closing is opened, the atmosphere inside said delivery chamber is sustained at a higher pressure than the pressure inside said plasma processing chamber by an inert gas supplied from an inert gas supply system.

4. A plasma processing apparatus according to claim 1, wherein;
the pressure inside said delivery chamber and the pressure inside said plasma processing chamber are set roughly equal to each other after said means for opening/closing is opened.

5. A plasma processing apparatus according to claim 1, wherein;
said workpiece is a semiconductor wafer or a glass substrate.

6. A plasma processing apparatus according to claim 1, wherein;
said plasma processing apparatus is any of: a plasma etching apparatus, a plasma CVD apparatus and a plasma ashing apparatus.

7. A plasma processing apparatus for implementing plasma processing on a workpiece, comprising:

a plasma processing chamber, the atmosphere in which is sustained at a reduced pressure during said plasma processing;

an electrode provided inside said plasma processing chamber that is constituted to allow said workpiece to be placed thereupon;

an electrostatic chuck provided at a mounting surface of said electrode that detachably electrostatic holds said workpiece when a high level DC voltage is applied thereto;

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a means for control that engages in control to induce a gas inside said delivery chamber into said plasma processing chamber by opening said means for opening/closing after said plasma processing is completed.

- before said means for opening/closing is opened, the atmosphere inside said delivery chamber is sustained at a higher pressure than the pressure inside said plasma processing chamber by an inert gas supplied from an inert gas supply system.

- the pressure inside said delivery chamber and the pressure inside said plasma processing chamber are set roughly equal to each other after said means for opening/closing is opened.

11. A plasma processing apparatus according to claim 7, wherein;

said plasma processing apparatus is any of: a plasma etching apparatus, a plasma CVD apparatus and a plasma ashing apparatus.

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12. A plasma processing method, comprising:
- a step in which a workpiece is placed at a mounting surface of an electrode provided inside a plasma processing chamber;
 - a step in which said workpiece is vacuum held by applying a high level DC voltage to an electrostatic chuck provided at said mounting surface of said electrode;
 - a step in which plasma processing is performed on said workpiece under a reduced pressure atmosphere;
 - a step in which said electrode is moved from an upper plasma processing position to a lower delivery position after said plasma processing ends; and
 - a step in which a means for opening/closing that switchably connects a delivery chamber engaged in transfer of said workpiece with said plasma processing chamber from/to said plasma processing chamber is opened to induce a gas inside said delivery chamber sustained at a higher pressure than the pressure inside said plasma processing chamber into said plasma processing chamber before said electrode reaches said delivery position.

13. A plasma processing method according to claim 12, further comprising;

a step in which a high level DC voltage with a reverse polarity from the polarity of said high level DC voltage applied to said electrostatic chuck while said electrostatic chuck is vacuum holding said workpiece is applied to said electrostatic chuck until immediately after said means for opening/closing is opened.

14. A plasma processing method according to claim 12, wherein;

before said means for opening/closing is opened, the atmosphere inside said delivery chamber is sustained at a higher

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pressure than the pressure inside said plasma processing chamber by an inert gas supplied from an inert gas supply system.

15. A plasma processing method according to claim 12, wherein;
the pressure inside said delivery chamber and the pressure inside said plasma processing chamber are set roughly equal to each other after said means for opening/closing is opened.

16. A plasma processing method according to claim 12, wherein;
said workpiece is a semiconductor wafer or a glass substrate.

17. A plasma processing method according to claim 12, wherein;
any plasma processing among plasma etching processing, plasma CVD processing and plasma ashing processing is implemented in said plasma processing method.

18. A plasma processing method, comprising:
a step in which a workpiece is placed at a mounting surface of an electrode provided inside a plasma processing chamber;
a step in which said workpiece is vacuum held by applying a high level DC voltage to an electrostatic chuck provided at said mounting surface of said electrode;
a step in which plasma processing is performed on said workpiece under a reduced pressure atmosphere;
a step in which a means for opening/closing that switchably connects a delivery chamber engaged in transfer of said workpiece with said plasma processing chamber to / from said plasma processing chamber is opened to induce a gas inside said delivery chamber sustained at a higher pressure than the pressure inside said

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plasma processing chamber into said plasma processing chamber after said plasma processing is completed.

19. A plasma processing method according to claim 18, wherein;
before said means for opening/closing is opened, the atmosphere inside said delivery chamber is sustained at a higher pressure than the pressure inside said plasma processing chamber by an inert gas supplied from an inert gas supply system.
20. A plasma processing method according to claim 18, wherein;
the pressure inside said delivery chamber and the pressure inside said plasma processing chamber are set roughly equal to each other after said means for opening/closing is opened.
21. A plasma processing method according to claim 18, wherein;
said workpiece is a semiconductor wafer or a glass substrate.
22. A plasma processing method according to claim 18, wherein;
any plasma processing among plasma etching processing, plasma CVD processing and plasma ashing processing is implemented in said plasma processing method.